CERTIFICATION REPORT

FOR

ENVIRONMENTAL H_2O LTD.

5 ERLINGTON DRIVE,
CINNAMINSON, NJ 08077

Report Generated By:

Office of Innovative Technology & Market Development
Division of Science, Research, and Technology
New Jersey Department of Environmental Protection
P.O. Box 409
Trenton, New Jersey 08625

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SECTION I

INTRODUCTION

The Energy and Environmental Technology Verification (EETV) Act at N.J.S.A. 13:1D-134 describes a verification/certification program to introduce innovative technologies that will benefit the various media of the environment in the State of New Jersey. According to the EETV Act, the New Jersey Department of Environmental Protection (NJDEP) shall certify a technology that has been verified by the New Jersey Corporation for Advanced Technology (NJCAT) to provide a net beneficial effect and satisfy the regulatory requirements of the NJDEP.

By attaining a certification from the NJDEP, the vendor of the technology can expect the following benefits:

1) The programs that issue permits can rely on the evaluation and verification process to establish contract provisions, protocols, policies, principles and/or technical guidance to develop expedited or more efficient timeframes for review and decision-making of permits or approvals associated with the IET;
2) The development and implementation of a series of outreach and education seminars to assist in the deployment and expedited commercial use of the IET; and
3) Working closely with the State Treasurer to be included in State bid specifications, as deemed appropriate by the State Treasurer.

In October 2003, the NJCAT submitted a verification report, on behalf of Environmental H_2O, Ltd., to the NJDEP so that its technology referred to as ISO GEN^{TM} can be considered for certification.

SECTION II

SUMMARY OF VERIFICATION REPORT FROM NJCAT

Technology Description

ISO-GEN™ uses an electrolytic cell to generate oxygen in situ, which is then dissolved in groundwater. The components of the technology are a submersible pump, the electrolytic cell, and a low-flow section above the electrolytic cell. These are assembled in a vertical assembly one on top of the other and placed in the well below the water table. A control panel, which controls DC power to the electrolytic cell and the submersible pump, is connected to the unit and is located above ground. Contaminated groundwater is pumped through the electrolytic cell where some of the water is separated into oxygen and hydrogen. The gases and water then flow upward through a low flow distribution section that is above the electrolytic cell. The oxygen that is generated in the cell is absorbed into the water and the oxygen-enriched water then mixes with the groundwater in the well area. The pumping action sets up a vertical circulation pattern, which provides for the distribution of the oxygen-enriched water and the surrounding groundwater.

The water with the higher dissolved oxygen resulting from the electrolytic generated oxygen changes the groundwater from an anaerobic to an aerobic condition. At the same time the oxidation-reduction potential of the groundwater system is increased. Under these conditions aerobic microorganisms are able to degrade the organic contaminants. Other reactive species such as hydroxyl ions can also be generated depending on the power supplied to the electrolytic cell and the contaminants present in the groundwater that is being pumped through the electrolytic cell. This allows for the degradation of contaminants such as BTEX, MTBE and other organics that are subject to degradation under aerobic conditions or subject to degradation by attack from reactive species such as hydroxyl ions in the presence of oxygen.

Technology's Verification Claims

Claim 1 – Full-scale field demonstrations have shown that the process of electrolysis used for the ISO-GEN™ technology generates dissolved oxygen in groundwater aquifers both in the groundwater well where ISO-GEN™ units are operated and at wells within the hydraulic radius of influence of the ISO-GEN™ operating wells.

Claim 2 – Pilot and full-scale field demonstrations have shown that the radius of influence observed for an ISO-GEN™ technology application extends in all directions including upgradient of the application well.

Claim 3 – Pilot and full-scale field demonstrations have shown that ISO-GEN™ produces positive changes in oxidation-reduction potential (ORP) in aquifers.

Claim 4 – Methyl tertiary-butyl ether (MTBE) has been shown to be bioremediated in the presence of oxygen and the ORP conditions created by ISO-GEN™ in microbially competent aquifers.

Claim 5 – Gasoline range aliphatic hydrocarbons (TPHg), diesel range aliphatic hydrocarbons (TPHd), benzene, ethyl benzene, toluene and xylene (BETX) have been shown to be bioremediated in the presence of oxygen and ORP conditions created by ISO-GEN™ in microbially competent aquifers.

Claim 6 – ISO-GEN™ produces a series of reactions in which no significant pH changes are measured in pilot and full-scale field demonstrations.

Case Studies Conducted

Five case studies were done at the following facilities:

1. Residential property down gradient of a retail gas station in Oregon City, Oregon.
2. Site of active gas station that is owned by Chevron Oil Company in the City of San Luis, Obispo, California.
3. Chevron Fuel Terminal located in San Jose, California.
4. Conoco Products Terminal located in Bozeman, Montana.
5. Chevron Fuel Terminal located in Banta, California.

Result from Case Studies

The result as described in the verification report is as follows:

1. All five case studies support claim 1.
2. All five case studies support claim 2.
3. Case studies 2 and 4, which are located in Obispo and Bozeman support claim 3.
4. Case studies 2 and 3, which are located in Obispo and San Jose support claim 4.
5. Case studies 1 and 4, which are located in Oregon City and Bozeman support claim 5.
6. Case studies 2 and 4, which are located in Obispo and Bozeman support claim 6.

SECTION III

CERTIFICATION OF TECHNOLOGY

Net Beneficial Effect Analysis

The ISO-GEN™ unit is a sealed unit that is lowered into the groundwater plume and circulates the groundwater through it electrolytic cells to add the oxygen to the contaminated groundwater. The electrolytic cells are powered by DC current, which is supplied to the ISO-GEN™ unit. Since the unit is not adding any contaminants to the contaminated groundwater, the only concern is the use of electricity to power the unit.

An analysis of the potential electricity usage of the ISO-GEN™ unit over a two-year period was compared to the energy usage of two other acceptable remediation technologies over the same time period. The other technologies in question are air sparging and soil vapor extraction. Based on the information given in the table below, as presented in the NJCAT's verification report, the ISO-GEN™ unit provides a net beneficial effect since it uses less energy than the air sparging and soil vapor extraction technologies.

Energy requirements for Installation and Operation of State-of the Practice And ISO-GEN™ Technologies (includes installation and operation).

Remediation Technology	Site Size		
	50' x 75'	0.25 acre	0.5 acre
ISO-GEN ™ (2-yr. Operation)	21,180 kWh	63,540 kWh	127,080 kWh
Air Sparging/SVE (2-yr. Operation)	80,430 kWh	175,320 kWh	350,640 kWh

Certification of the ISO-GEN™ Unit

Overall, all of the claims made for the technology are satisfied through the five case studies. However, certain limitations exist as to the extent of the technology's successful repeated performance. For the technology to work best, the groundwater in the location of remediation must contain low concentrations of dissolved oxygen, and the appropriate microbes that promote biodegradation must exist in sufficient concentrations to utilize the oxygen and contaminants to degrade the chemicals of concern. Also, the ISO-GEN™ unit is only available in a small commercial version that is suitable gasoline stations and small industrial sites.

However, the limitations described above are not critical if the site selection process is done according to the criteria of the technology's performance. Therefore, since the ISO-GEN™ unit produces a net beneficial effect, the NJDEP hereby issues a **certification** to the claims as stated in the NJCAT's verification report.